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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

CHU, RANDOLPH I

ART UNIT

PAPER NUMBER

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/733,741	Applicant(s) KOEHLER ET AL.	
	Examiner RANDOLPH CHU	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 6 is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

In response to applicant's amendment received on 1/4/2008, all requested changes to the claims have been entered.

Response to Argument

1. Applicant's arguments filed on 1/4/2008 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 4, and 5 are rejected under 35 USC 103(a) as being unpatentable over Brandt et al. ("Automatic Alignment of Electron Tomography Images Using Markers", Intelligent Robots and Computer Vision XIX, SPIE Preceding Series, Nov. 2000) in view of Brunner et al. (US 2003/0100998).

With respect to claim 1, Brandt teaches,

applying markers (small colloidal gold particle) to a sample to be imaged by the electron microscope (electron tomography) (abstract);

providing a tilt series of images of the sample (1. Instruction);

identifying a first set of candidate markers in each of the images in the tilt series (2. Initial Correspondence of Image);

attributing at least one probability parameter to each candidate marker in each image (2.1 Harris Corner Detector and 2.2 Matching Through Correlation and Relaxation);

selecting a second set as a subset of candidate markers from the first set of candidate markers on the basis of said at least one probability parameter (3. Epipolar Geometry);

projecting the candidate markers in the second set onto a sole image (4. Fiducial Marker Localization);

aligning the images in the tilt series on the basis of the identified candidate markers (6. Parameter Optimization).

Brandt et al. does not teach expressly that applying a fitting algorithm to determine a set of parallel straight lines or very elongate ellipses best fitting the candidate markers in the sole image to identify a third subset of candidate markers.

Brunner et al. teaches applying a fitting algorithm to determine very elongate ellipses (ellipse is elongated) best fitting the candidate markers (self organizing map (SOM) minimize the distance between the active pixel and a number of nodes) in the sole image to identify a third subset of candidate markers (result of fitting method) (para [0276]).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use fitting algorithm to determine a set of parallel straight lines or very elongate ellipses best fitting in the method of Brandt et al.

The suggestion/motivation for doing so would have been that it minimizes the distance between the active pixels and a number of nodes.

Therefore, it would have been obvious to combine Brunner et al. with Brandt et al. and to obtain the invention as specified in claim 1.

With respect to claim 4, Brandt teaches a cross correlation process is applied to the images of the tilt series (1. Introduction, 3rd paragraph).

With respect to claim 5, Brandt teaches probability parameter is derived from at least one of the quantities: size of the marker and local contrast of the marker (4. Fiducial Marker Localization, 2nd paragraph).

With respect to claim 9, Brandt teaches probability parameter is derived from at least one of the quantities: size of the marker and local contrast of the marker (4. Fiducial Marker Localization, 2nd paragraph).

3. Claims 2 and 7 are rejected under 35 USC 103(a) as being unpatentable over Brandt et al. ("Automatic Alignment of Electron Tomography Images Using Markers", Intelligent Robots and Computer Vision XIX, SPIE Preceding Series, Nov. 2000) in view of Brunner et al. (US 2003/0100998) and in further view of Russ (The Image Processing Handbook, CRC press, 1994, pages 495-500).

With respect to claim 2, Brandt et al. and Brunner et al. teach all the limitations of claim 1 as applied above from which claim 2 respectively depend.

Brandt et al. and Brunner et al. does not teach expressly that fitting algorithm used to determine the set of parallel straight lines comprises the Hough transformation.

Russ teaches fitting algorithm used to determine the set of parallel straight lines comprises the Hough transformation (Page 497).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Hough transformation to determine the set of parallel straight lines in the method of Brandt et al. and Brunner et al.

The suggestion/motivation for doing so would have been that the Hough transform is superior because it minimizes the deviations of points from the line in a direction to the line, and it deals correctly with the case of the points not being uniformly distributed along the line.

Therefore, it would have been obvious to combine Russ with Brandt et al. and Brunner et al. to obtain the invention as specified in claim 2.

With respect to claim 7, Brandt teaches probability parameter is derived from at least one of the quantities: size of the marker and local contrast of the marker (4. Fiducial Marker Localization, 2nd paragraph).

4. Claims 3 and 8 are rejected under 35 USC 103(a) as being unpatentable over Brandt et al. ("Automatic Alignment of Electron Tomography Images Using Markers", Intelligent Robots and Computer Vision XIX, SPIE Preceding Series, Nov. 2000) in view of Ballard ("Generalizing The Hough Transform to Detect Arbitrary Shapes", Pattern Recognition, Vol 13, No 2, page 111-122, 1981).

With respect to claim 3, Brandt et al. and Brunner et al. teach all the limitations of claim 1 as applied above from which claim 2 respectively depend.

Brandt et al. and Brunner et al. do not teach expressly that the fitting algorithm used to determine the set of parallel straight lines or to determine a set of very elongate ellipses is constituted by the Generalized Hough transformation.

Ballard teaches fitting algorithm used to determine the set of parallel straight lines comprises the Generalized Hough transformation.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use Generalized Hough transformation to determine the set of parallel straight lines in the method of Brandt et al. and Brunner et al.

The suggestion/motivation for doing so would have been that the Hough transform is superior it can detect an object with an analytic equation.

Therefore, it would have been obvious to combine Ballard with Brandt et al. and Brunner et al. to obtain the invention as specified in claim 3.

With respect to claim 8, Brandt teaches probability parameter is derived from at least one of the quantities: size of the marker and local contrast of the marker (4. Fiducial Marker Localization, 2nd paragraph).

Allowable Subject Matter

1. Claim 6 is allowed.

The following is an examiner's statement of reasons for allowance:

Claim 6 is allowable over the prior art of record because none of the prior art of record teaches the combined claimed elements as set forth in the claim 6.

None of the prior art of record teaches or fairly suggests that image processing method for alignment or tilt series using deriving for each candidate marker in the second set a sine-shaped curve based on coordinates of the corresponding candidate marker according to the Hough transformation; deriving from the sine-shaped curves a number of histograms indicating, for each direction, the relation between the density of candidate markers and the line distance parameter according to the Hough transformation; applying an entropy operation to each of the histograms, resulting in a set of entropy parameters, one entropy parameter for each histogram; establishing the minimum value in the set of entropy parameters; identifying the histogram corresponding to said minimum value as the one showing the highest degree of peak diversity; selecting from the latter histogram a number of peaks, and together with combination of other claimed elements as set forth in the independent claim 6. Therefore, the claim 6 are over the prior art of records.

Any comments considered necessary by applicant must be submitted no later than payment of the issue fee and, to avoid processing delay, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reason for Allowance."

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randolph Chu whose telephone number is 571-270-1145. The examiner can normally be reached on Monday to Thursday from 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on 571-272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2624

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/RIC/

/Matthew C Bella/

Supervisory Patent Examiner, Art Unit 2624